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seven-sixteenths. If this be a true nut, the position in which it was found is remarkable. Though exactly like ferruginous nodules of the neighboring coal measures, it cannot be supposed to belong to paleozoic time. It might, however, belong to the Dacotah sandstone of mezozoic times. If so, it will be another fact pointing towards a more eastern extension of the cretaceous formations than their present outcrop indicates. Still, the writer has found a large inoceramus in a creek bed eight miles east of Manhattan, and Dacotah gravel in Atchison county. Bits of chalk are not uncommon in secondary drift. The distance to which such concretions might be carried by quaternary agencies (or tertiary) is not easy to fix, and it may be that the carriage of our fossil is nearly from the present outcrop of the Dacotah formation, though how it crossed the high ridge of the Flint hills is still a difficulty.

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#### NOTES AND DESCRIPTIONS OF NORTH AMERICAN TABANIDÆ.

BY S. W. WILLISTON, PH.D.

A review of my material in the family *Tabanidæ* has furnished occasion for notes of more or less interest, and the description of a number of species which I believe to be new. This material, including one hundred and ten species, has enabled me to identify with assurance most of the known species—a task that has been greatly lightened by Osten Sacken's thorough work in this family.

It is of interest to note that, hitherto, not a single one of our species in this family has been found identical with a European one, a statement that I think cannot be made of any other dipterous family of any size. The North American *T. flavipes* Wied. has, it is true, been discovered from among specimens from the Amoor in eastern Siberia, by Brauer, in company with a species common to Europe; but this is, I believe, the only known instance in which the habitats of any European and American species have been found to be anywhere in common.

The characters given by Osten Sacken for the disruption of *Tabanus* into the smaller groups, *Therioplectes* and *Atylotus*, though of importance, are insufficient, I believe, to warrant their use as generic characters. The genus *Atylotus*, Osten Sacken based chiefly upon the absence of the ocellar tubercle and the presence of ocular pilosity, but that he did not accept these characters himself as the chief generic distinctions is shown conclusively by his final location of *T. Rheinwardtii* Wied. and *T. cerastes* O. S., both with the above-given peculiarities, under *Tabanus sensu stricto*. On the other hand, other minor differences given for this genus Brauer states are not applicable to the European species. In some cases the ocellar tubercle is a distinct and easily appreciable character, but in others it is nearly or quite impossible to decide whether a given species has or has not such a tubercle. Certainly, in my early experience in the use of the table prefixed to Osten Sacken's Prodrôme, no character was a greater source of doubt to me than the present. The character, moreover, is a sexual one, the ocellar tubercle being present in males where it is absent in females. For these reasons I have rejected *Therioplectes* and *Atylotus* as genera, though the retention of the names is desirable as expressing in many species certain definite groups of characters.

As usual in collections, I have but few males for comparison, but it is possible that a character of some value may be found in the claws, pulvilli and empodia. Whether they are enlarged in all males, I do not know; certainly they are in many.

## PANGONIA RASA Loew.

## PANGONIA.

Three female specimens from Connecticut. The palpi in this species are very slender, and the legs of my specimens seem to be lighter colored than they are described.

## PANGONIA TRANQUILLA Osten Sacken.

A male specimen from New York agrees well with the description; the palpi are noticeably shorter than in the males of any other species known to me.

## PANGONIA FERA, n. sp.

*Male*: Length 12 mm. Black; eyes bare; proboscis longer than the tibiae; basal segments of abdomen yellowish red on the sides and hind margin; wings brownish subhyaline, first posterior cell open; face brownish gray, with black pile; first two joints of antennae black, with black hairs; palpi slender, black, with loose black hair; ocelli present. Proboscis black; labellae small; dorsum of thorax brownish black, with some grayish dust, and blackish pile; pleurae with some yellowish pile above; abdomen black, with black pile, the three basal segments broadly on the sides, and wholly on the venter, yellowish red; second, third and fourth segments with the posterior margin yellow, fringed with golden pile; wings brownish subhyaline, more distinctly clouded in front toward the stigma; costal and subcostal cells luteous yellow; legs wholly black, with black pile.

One specimen, Mt. Hood, Or. Is nearest allied to *P. tranquilla* O. S., but the more slender palpi and the black pilosity will readily distinguish it; the proboscis is also distinctly longer.

PANGONIA INCISURALIS Say (*P. incisa*, Wiedemann).

One specimen, from New Mexico. This species will be readily recognized by the elongate proboscis, small labellae, fasciate abdomen, and closed first posterior cell.

## PANGONIA CHRYSOCOMA Osten Sacken.

A single male specimen, from New York, is evidently of this species, though the sides of the abdomen are largely yellow. The author does not mention the slender yellow palpi, clothed with long, loose, black pile. The front tarsi, especially the first joints, are more slender than usual.

## PANGONIA DIVES, n. sp.

*Female*: Length 13-15 mm. Head yellowish gray, the front more brownish. Antennae reddish yellow, the annulate portion of the third joint largely black. Palpi yellowish red, at the base with light-colored pile, otherwise with short black, more or less intermixed with white hair. Proboscis about as long as the head, not extending much beyond the palpi, the labellae large. Ocelli present. Dorsum of thorax covered with nearly uniform brownish or yellowish gray dust, nearly concealing the black ground-color; pubescence short, appressed, light yellowish. Pleurae rather thickly gray pollinose and pilose. Scutellum like the thoracic dorsum, pile light yellow. Abdomen brownish yellow, the anterior part of the segments brownish or blackish, with more or less short black hair, the posterior part and margin with light yellow hair. Legs reddish yellow, the tibiae somewhat, the tarsi more, brownish. Wings nearly hyaline, the costal and subcostal cells yellowish; all the posterior cells open, second submarginal cell appendiculate.

*Male*: Eyes distinctly pubescent. Face and the slender palpi with long, abundant, light yellowish hair, near the tip of the latter black. Thorax with rather abundant light yellow pile.

One male and four females, California. The eyes in life appear to be uniformly green, or purplish green. The basal abdominal segments of the male are only faintly brownish anteriorly, with a black spot, clad with black hair, near the middle. An-

other male, from Washington Territory, which I believe to be of the same species, is much darker, the abdominal segments dark reddish brown and black pilose, the hind margins yellowish, with a fringe of light yellow pile. The pile of the body seems longer, that on the dorsum of the thorax intermixed with blackish, and the black of the antennæ is better marked. The species is nearest allied to *P. pigra* O. S. There are, however, no dorsal thoracic stripes, the pollen being nearly uniform, the second submarginal cell is appendiculate, etc.

## SILVIUS.

*SILVIUS GIGANTULUS* Loew.

This species seems to be very common in the West. I have specimens from Washington Territory, California, Colorado, and New Mexico.

*SILVIUS QUADRIVITTATUS* Say, Journ. Acad. Phil. iii, 33, 1; Compl. Wr. ii, 54 (*Chrysops*); Wiedemann, Auss. zweiff. Ins. i, 200, 9 (*id.*)

A female specimen from California agrees so well with the descriptions of this species that I refer it here. The chief ground for doubt in the determination, is the difference of locality, Say's specimen being from "Near the Rocky Mountains." This is, however, of little moment, in consideration of the fact that so many of the species of the Californian fauna reappear in Colorado. The species differs from *S. pollinosus* Will. in being darker throughout, in the antennæ being more slender, in the dorsum of the thorax having gray stripes on a black ground, and in the four abdominal stripes being better marked.

*SILVIUS POLLINOSUS* Williston, Trans. Connecticut Acad. iv, 244—Western Kansas.

Additional specimens of this species differ from the types in their much larger size (11–12 mm.) The wings have a whitish appearance and light-colored veins, the small clouds on the cross-veins darker and more conspicuous, with none on the course of the veins themselves. I hardly think it probable that this is the *Chrysops quadrivittatus* of Say and Wiedemann, since there are no blackish stripes on the dorsum of the thorax. As regards the generic location of both this and the preceding species, there may be a question. The structure is quite like that of *S. gigantulus*, but the general appearance is very different. The eyes, as revived over wet sand, show the characteristic markings of *Silvius*, that is, numerous irregularly scattered black dots over a green background. The species must resemble those of the European *Nemorius* Rondani, and may perhaps belong there. The third joint of the antennæ, however, is considerably longer than the first two together.

## APATOLESTES.

Williston, Entom. Americana, i, 12, 1885.

*APATOLESTES COMASTES* Williston, l. c.—California.

## CHRYSOPS.

## SUPPLEMENTARY TABLE OF SPECIES.

- |  |                     |
|--|---------------------|
| 1. Cross-band obsolescent; abdomen black.....  | NIGRIBIMBO Whitney. |
| Cross-band distinct.....   | 2                   |
| 2. Apex of wing beyond cross-band hyaline.....   | 3                   |
| Costal margin beyond cross-band more or less infuscated.....   | 4                   |
| 3. Second basal cell infuscated on extreme basal part; abdominal segments with posterior gray borders..... | SORDIDUS O. S.      |
| Second basal cell largely infuscated; abdominal segments without posterior gray borders.....               | CUCULUX Whitney.    |

4. First basal cell hyaline; first antennal joint thickened (San Domingo).  
FRAZARI, n. sp.  
First basal cell largely infuscated. . . . . 5
5. Second basal cell infuscated on the proximal third or beyond. . . . . 6  
Second basal cell hyaline . . . . . 8
6. Prevailing color of body black; palpi blackish. . . . . 7  
Prevailing color of body brownish yellow; palpi reddish. . . . . FULVASTER O. S.
7. Abdomen wholly black . . . . . PERTINAX, n. sp.  
Sides of first and second abdominal segments red. . . . . NOCTIFER O. S.
8. First antennal joint distinctly thickened. . . . . PACHYCERA, n. sp.  
First joint not distinctly thickened. . . . . 9
9. A hyaline spot in the discal cell . . . . . DISCALIS Will.  
No hyaline spot in the discal cell. . . . . 10
10. Abdomen with four continuous black stripes . . . . . SEQUAX, n. sp.  
Abdomen not striped. . . . . 11
11. The black facial callosities small, not converging inferiorly. . . . . PROCLIVUS O. S.  
The black facial callosities large, converging inferiorly; dorsum of thorax distinctly vittate . . . . . SURDUS O. S.

*CHRYSOPS EXCITANS* Walker.

I have numerous specimens of this species from Washington, where it seems to be common, with others from Anticosti. The latter have no reddish yellow on the sides of the third abdominal segment, as is the case with the Western ones.

*CHRYSOPS MITIS* O. S.

A specimen from Montana agrees very well with the description of this species, except in size (9 mm.).

*CHRYSOPS FUGAX* Osten Sacken.

Specimens that I refer to this species I have from Anticosti, Massachusetts, and North Park, Colorado. Some of these specimens have the thoracic pollinose markings and the pubescent triangles of the abdomen well indicated, so that the presence of the small hyaline spot at the base of the fifth posterior cell—a slight character—is about all that can be relied upon to distinguish it from *C. mitis*. The Colorado specimen has the four posterior femora largely reddish at the base.

*CHRYSOPS ÆSTUANS* v. d. Wulp.—Western Kansas.

*CHRYSOPS CALLIDUS* Osten Sacken.

A single female specimen from Washington Territory, I am unable to satisfactorily distinguish from this Eastern species. The distal part of the costa is less distinctly clouded, and the cross-band less dark, especially posteriorly. The third and fourth abdominal segments are less dark, leaving only a pair of basal triangles.

*CHRYSOPS PERTINAX*, n. sp.

*Female*: Length 9–11 mm. Front gray, the large transverse callosity shining black. Face light yellow, the large callosities black, broadly coalescent above the oral margin, and separated from the shining black cheeks. Antennæ black, slender, first two joints reddish at base, and together about two-thirds as long as the third joint. Dorsum of thorax black, with two broad, median, anterior, greenish-gray stripes, limited by three slender brown ones. Abdomen shining black, in well-preserved specimens, with small median triangles of whitish pubescence, and with similar

pubescence on the posterior segments. Legs black, the four posterior tarsi a little reddish at base. Wings with dark-brown markings, filling out two-thirds or more of both basal cells, the cross-band not reaching the posterior margin, but including the base of the fifth posterior cell. The apical costal spot is diffuse, and reaches only a little way into the second submarginal cell, and is separated from the cross-band by the hyaline continuation of the halo, which reaches quite to the costa.

Eight specimens, Washington Territory. In some the legs are more brownish. The species approaches *C. celer* most closely, but will be at once distinguished by the apical costal cloud, and by the less bushy gray, not fulvous, pile of the pleuræ.

*CHRYSOPS MOECHUS* Osten Sacken.

One specimen from Cumberland Gap, and one without locality. The latter is on the same pin with a specimen of *C. pudicus* Osten Sacken.

*CHRYSOPS FRAZARI*, n. sp.

*Female*: Length 8 mm. Front yellowish gray, the large callosity black. Face grayish yellowish on its borders, elsewhere luteous yellow shining. Antennæ elongate, the first two joints together considerably longer than the third, the first joint considerably thickened; first joint reddish, second joint reddish brown, third black. Dorsum of thorax blackish brown, with four very distinct yellow pollinose stripes, the median ones remote, slender, broadly interrupted posteriorly, and contiguous on the front margin with the broader entire lateral ones. Pleuræ brownish black, with six distinct spots of yellow pollen, the smallest just above the front coxæ. Abdomen dark brown, the first segment with two small yellow pollinose spots on each side, the posterior ones obsolete; second segment with a median stripe, the large anterior angles reaching the whole length of the segment, and two spots behind, the next three segments each with three small, more or less confluent spots on the lateral margin, the third segment with an additional median one in front. Wings almost pure hyaline, with distinctly limited dark-brown markings as follows: Anterior margin to the apex not, or but faintly, encroached upon in the marginal cell beyond the cross-band, the extreme base of both basal cells, and the cross-band, reaching to the hind margin at the tip of the first posterior and anal cells, leaving a hyaline sinus in the fifth posterior cell posteriorly. Legs luteous yellow, the knees and more or less of all the tibiæ, especially of the hind pair, and tarsi, brown or blackish; hind tibiæ with a distinct fringe of black pile outwardly. Venter dark brown, with two broad yellow stripes.

One specimen, San Domingo (G. F. Frazar).

*CHRYSOPS SEQUAX*, n. sp.

*Female*: Length 8, 9 mm. Front yellowish gray, the callosity black. Face mostly black, bare, reddish yellow, the callosities more or less black. Antennæ elongate, slender, the first joint longer than the second, the two together about as long as the third; first two joints yellowish, the third almost wholly black. Palpi yellowish or brownish. Dorsum of thorax with four broad, distinct stripes, the lateral ones more yellow, the median ones greenish yellowish gray and separated by a slender stripe. Pleuræ grayish yellow pollinose, with a longitudinal black stripe. Abdomen yellow, brownish or blackish distally, with four distinct black stripes reaching from or near the base, the lateral ones slender or partially obsolete anteriorly. Scutellum sometimes yellow on its border. Venter yellow, with a broad median and a more slender lateral black stripe. First basal cell of the wings wholly filled out with brown, the second hyaline; the cross-band reaches the hind margin, but the fifth posterior cell is largely hyaline at its base; anal cell open; wings broadly clouded distally, including nearly all of the second submarginal cell, and encroaching upon the first posterior, the hyaline arcuation between the cross-band and spot slender, scarcely transcending

the second longitudinal vein. Legs yellow or brownish yellow, the knees, distal part of front tibiæ, their tarsi, and the base of hind femora, black; sometimes the base of middle femora, the tip of their tibiæ, and the whole hind legs, except the base of the tarsi, black.

*Male*: Black abdominal stripes stronger and more distinct, the median ones more coalescent on the first and anterior part of second segment; the wings darker, with the second basal cell almost wholly brown, the only wholly hyaline portions being at the outer end of the second basal cell, encroaching upon the base of the fifth posterior cell, and the slender crescentic spot beyond the cross-band.

Four females and one male, Western Kansas.

*CHRYSOPS PLANGENS* Wiedemann.

Specimens of this species from Georgia, though smaller, agree in other respects with ones from Connecticut.

*CHRYSOPS SORDIDUS* Osten Sacken.

Two specimens of this species from the White Mountains, while agreeing well with the description, would not be correctly located in Osten Sacken's table, by reason of the slight infuscation at the base of the second basal cell.

*CHRYSOPS CUCLUX* Whitney, Can. Entom. xi, 35.

This species, (closely allied to *C. sordidus*, according to the author,) I do not know.

*CHRYSOPS CURSIM* Whitney, Can. Entom. xi, 36.

I do not see wherein this species differs from *C. pudicus* Osten Sacken.

*CHRYSOPS SURDUS* Osten Sacken.

Specimens from California agree very well with the description, but others, from Washington Territory, have the yellow of the face extending to the oral margin in front, and the grayish stripes of the thorax extending distinctly the whole length of the dorsum. The third and following abdominal segments have a narrow posterior yellow margin, and the third and fourth segments have each a median stripe.

*CHRYSOPS PROCLIVUS* Osten Sacken.

Specimens from California, Washington Territory, and Mt. Hood, Oregon, agree very well with the description.

*CHRYSOPS FULVASTER* Osten Sacken.

Numerous specimens from Colorado and Montana I identify with this species, though there is some variation among them. In the Montana specimen the second abdominal segment is chiefly blackish, with the posterior margin, a median expansion, and the anterior angles yellowish. In the males the segments have each a small yellow median posterior expansion. Osten Sacken omits a striking characteristic of the species, viz., the thickening of the first antennal joint. Near the close of his description of the female, "fourth posterior" should read fifth posterior.

*CHRYSOPS DISCALIS* Williston, Trans. Connecticut Acad., iv, 245.

*CHRYSOPS COSTATUS* Fabr.

San Domingo. Belongs to the group with a hyaline spot in the discal cell; it has, also, very slender antennæ.

*CHRYSOPS PACHYCERA*, n. sp.

*Female*: Length 8, 9 mm. Facial callosities yellow (probably with blackish in some specimens). Front, yellow; the callosity shining reddish-yellow, somewhat margined with blackish above. Antennæ elongate, the first two joints together longer

than the third; first joint swollen, yellow; second joint a little darker; third, except the base, black. Dorsum of thorax with browish-yellow pollen, the median geminate stripes separated by a shining black interval from the more yellow lateral margins. Abdomen: The two basal segments yellow; the first with a transverse black spot below the scutellum, the second with two oval divergent spots, and toward the posterior margin, on the outer side, with a small rounded spot; third, fourth, and fifth segments each with four elongate spots (those of each lateral pair of the third may be coalescent in front), not reaching the hind margin. Venter with a broad median and a slender lateral black stripe. Legs yellow, the knees, distal part of front tibiæ, and the front tarsi, blackish. First basal cell infuscated upon its basal two-thirds, the second on its basal third; the cross-band reaches the hind margin, leaving a small hyaline space in the fifth posterior cell, the discal cell not lighter; the apical spot fills out the marginal cell completely, and reaches into the second sub-marginal.

*Male:* Antennæ a little darker, the first two joints not as long together as the third, the first joint less swollen. Abdomen black, the narrow lateral margins of the anterior segments yellow, extending in on the hind margin of the first segment and across the hind margin of the remaining ones; the second, third, and fourth segments each with three small triangular expansions on the hind margin. Front and hind legs chiefly black, the middle legs chiefly, and the base of the hind tarsi, yellow. Wings darker, the second basal cell infuscated, but with a subhyaline stripe along the middle; discal cell with a subhyaline spot.

Three specimens, California: The difference in the antennæ and the hyaline spot in the discal cell make the union of the two sexes as above described, somewhat doubtful. The species is allied to *C. fulvaster*, but will be distinguished by the lateral yellow spots on the abdominal segments, etc.

#### HÆMATOPOTA.

##### HÆMATOPOTA AMERICANA Osten Sacken.

A specimen from California has the four posterior metatarsi with only a vestige of white color at the base, but otherwise agrees very well with the description, excepting that I would hardly describe the first antennal joint as "very much incrassated." The wide distribution of the species renders it probable that it is identical with Macquart's *H. punctulata* from Carolina.

#### TABANUS.

##### SUPPLEMENTARY TABLE OF SPECIES.

1. Eyes pubescent.....	15
Eyes bare .....	2
2. Abdomen with definite white markings.....	3
Abdomen without definite white markings ....	14
3. The white markings of the abdomen consist of a single row of triangles, or a median stripe .....	4
The white markings consist of two or three rows of triangles or spots .....	10
Abdomen brownish reddish, with whitish posterior borders to the segments.	
ANNULATUS Say.	
4. Wings distinctly spotted or clouded with brown .....	5
Wings without distinct clouds on the cross-veins; prevailing color of antennæ black; dark species.....	SODALIS, n. sp.
5. Very small species; abdomen with a whitish stripe and incisures (San Domingo.)	
PARVULUS, n. sp.	
Abdomen with triangles; larger species.....	6



6. Antennæ red; veins of wings clouded. . . . . 7  
 Antennæ largely black. . . . . 9
7. Frontal callosity nearly square; annulate portion of third joint short. *FUR*, n. sp.  
 Frontal callosity very narrow; annulate portion of antennæ very long.  
TURBIDUS Wied.
8. First posterior cell closed; front remarkably narrow. . . . . *ABDOMINALIS* Fabr.  
 First posterior cell open. . . . . 9
9. Abdominal triangles of moderate size . . . . . *EXUL* O.S.  
 Abdominal triangles large. . . . . *SULCIFRONS* Macq.
10. The lateral spots of the abdomen touch the hind margin. . . . . 11  
 The lateral spots do not touch the hind margin; small species. . . . . 13
11. Middle sized, elongate species . . . . . *GRACILIS* Wied.  
 Small species; third antennal joint broad. . . . . 12
12. Frontal callosity not denuded. . . . . *PYGMEUS*, n. sp.  
 Frontal callosity denuded. . . . . *SPARUS* Whitney.
13. Basal part of third joint broad . . . . . *PUMILUS* Macq.  
 Basal part of third joint narrow; darker . . . . . *FRATELLUS*, n. sp.
14. Wings nearly hyaline . . . . . *EGROTUS* O.S.  
 Wings brown in front (San Domingo). . . . . *FENESTRA*, n. sp.
15. Abdomen black, without red on the sides. . . . . 16  
 Abdomen more or less broadly red on the sides. . . . . 17
16. Abdominal segments with a narrow hind border of whitish dust and pubescence,  
 expanding into median triangles . . . . . *SEQUAX*, n. sp.  
 Abdomen without grayish borders or triangle; thickly pilose, thick-set species.  
PROCYON O.S.
17. Palpi dark; abdomen red with a median black stripe. . . . . *MEGERLEI* Wied.  
 Palpi light yellow. . . . . 18.
18. Prevailing color of antennæ red; front convergent anteriorly. . . *COMASTES*, n. sp.  
 Prevailing color of antennæ black. . . . . 19.
19. Front gray . . . . . *PHÆNOPS* O.S.  
 Front brownish . . . . . *SONOMENSIS* O.S.

The following species, published since the appearance of Osten Sacken's catalogue, I do not know:

*TABANUS SUPERJUMENTARIUS* Whitney, Can. Entom. xi, 37. New Hampshire.

*TABANUS DODGEI* Whitney, Can. Entom. xi, 37. Nebraska.

"Eyes pubescent; ocellar tubercle wanting; abdomen brown, with two broad white stripes of subequal width with the space between. Wings hyaline, 12-14 mm."

*TABANUS ALLYNI* Marten, Can. Entom. xv, 110. North Carolina.

Eyes bare; abdomen broadly yellow on the sides; 15 mm.

*TABANUS TETRICUS* Marten, Can. Entom. xv, 111. Montana.

A *Theriopectes* of the group of *T. rhombicus*, with denuded subcallus.

*TABANUS FRENCHII* Marten, Can. Entom. xv, 111. Montana.

A *Theriopectes* allied to *T. microcephalus* apparently. The black face with white hair is rather peculiar.

*TABANUS SUSURRUS* Marten, Can. Entom. xv, 111. Montana.

Evidently allied to *T. rhombicus* (*Therioptectes*.)

A. Eyes pubescent, *THERIOPECTES*.

*TABANUS AFFINIS* Kirby.

A single, somewhat rubbed specimen, from Colorado, seems to be of this species.

*TABANUS RHOMBICUS* Osten Sacken.

A number of species from Colorado agree so well with the description of this species that I feel quite sure of my determination. They belong, however, in the two groups described by Osten Sacken in his *Western Diptera* (p. 218), agreeing well with the characters there given, except that I can perceive no difference in the subcostal cell. It would seem probable that there are distinct species among them, yet specimens of the two forms were collected together in North Park. *T. susurrus* Marten must be closely allied, though the prominent angle of the antennæ seems to indicate a distinct species.

*TABANUS SEQUAX*, n.sp.

*Female*: Length 14–16 mm. Front of nearly equal width, brownish, with black pile; callosity squarish or subcordate, black; extending above into a line; subcallus not denuded. Antennæ wholly deep black, the annulate portion of the third joint about three-fifths as long as the basal portion; angle obtusely projecting. Face gray, with whitish pile. Palpi grayish black, with black hair. Dorsum of thorax grayish black, with rather abundant, mostly black pile, and two not very distinct grayish stripes anteriorly; a tuft of white pile on the post-alar callosities. Pleuræ with white pile. Abdomen black, the segments with a narrow hind border of whitish dust and pubescence, interrupted on each side of the small median triangular expansion. Legs black, the base of four anterior tibiæ faintly reddish. Wings hyaline, the cross-veins and furcation of third vein with small but distinct brown clouds.

Three specimens, Mt. Hood, Oregon. The eyes in this species are distinctly pubescent, and the vertex has a partially denuded tract, though I cannot distinguish any ocellar tubercle.

*TABANUS COMASTES*, n.sp.

*Female*: Length, 14–16 mm. Face yellowish-gray, with similarly colored pile. Palpi moderately stout, yellow, with black hairs. Antennæ red, the annulate portion black, the basal joints more or less blackish; basal portion broad, a little longer than the annulate portion, the angle moderately projecting. Front convergent anteriorly, yellowish or grayish-brown, with black pile; callosity nearly square, black. Subcallus denuded, shining black; ocellar tubercle distinct. Dorsum of thorax grayish brownish black, with fulvous pubescence and black pile; ante-alar callosity reddish. Pleuræ gray, with grayish pile. Abdomen black in the middle, expanding anteriorly, and on the fifth and following segments; broadly yellowish or brownish red on the sides; the posterior margins of the segments (expanding a little in the middle of the anterior segments) lighter yellow, with a fringe of golden pile. Venter yellowish red, black distally. Legs black, the base of the front tibiæ, and the four posterior femora distally, their tibiæ and tarsi (except their brownish distal parts), reddish yellow; hind tibiæ black ciliate. Wings nearly hyaline.

*Male*: The basal portion of the third antennal joint narrower, more excised above, and with the angle more drawn out. Eyes, thorax and legs more thickly pilose.

Five females and one male from Washington Territory and Mt. Hood, Oregon. The species resembles *T. lasiophthalmus*, but will be at once distinguished by the absence of brown clouds on the wings. The black on the second and third abdominal segments might better be described as forming two rounded or quadrate spots;

on the fourth the black is more extensive, and on the fifth there may be some reddish as well as the lateral margins.

*TABANUS CINCTUS* Fabricius.

This species is common in Connecticut, and is very conspicuous by reason of the bright yellow basal part of the abdomen. Baron Osten Sacken rather incorrectly describes the color as yellowish red.

*TABANUS REINWARDTII* Wiedemann.—Western Kansas.

*TABANUS MEGERLEI* Wiedemann.

The possession of two specimens of this species in good condition, from Florida, enables me to give a more complete description, as follows:

*Female*: Length 17–20 mm. Antennæ deep red, the annulate portion of third joint blackish, the angle of the third joint produced into a long slender process. Face yellowish brown, with brown pile. Front brown, below the callosity yellowish white, of nearly equal width; callosity nearly black, scarcely higher than broad. Palpi yellowish, clothed with black hairs, giving them a brownish appearance. A patch of black pile at the denuded vertex. Eyes distinctly pubescent. Dorsum of thorax brownish-black, reddish on the sides, with fulvous pubescence and indistinct grayish stripes. Pleuræ black, somewhat reddish in the middle, with black pile. Abdomen yellowish red; a broad black stripe, obscurely narrowed on the second and third segments, the lateral margins also black; the fulvous portion has fulvous pubescence in front, whitish pubescence and pollen behind. Venter yellowish and brownish red, with abundant silvery pollen and pile. Legs dark reddish brown, the femora more blackish. Wings brown on the proximal part, the cross-veins and furcation of third vein with dark-brown clouds.

*TABANUS INSUETUS* Osten Sacken.

A single specimen from North Park, Colorado, agrees so closely with the description of this species, that I have little or no doubt of the identity, notwithstanding the difference in locality.

B. Eyes bare, *TABANUS*.

*TABANUS TURBIDUS* Wiedemann.

A female specimen from Alabama is evidently of this species, but the angle of the third antennal joint is distinctly drawn out into a point.

*TABANUS FRONTO* Osten Sacken.

A female from Florida, evidently of this species, is nineteen millimeters in length, the abdomen is largely blackish posteriorly, and the first posterior cell is closed.

*TABANUS ABDOMINALIS* Fabricius.

*TABANUS EXUL* Osten Sacken.

Specimens of the above two species from Kentucky and Virginia leave no doubt of the propriety in separating them on the frontal width and the open first posterior cell.

*TABANUS SULCIFRONS* Macquart (*tectus* O. S.)

Two specimens from Louisiana agree with the ones described by Osten Sacken from Texas in having the abdomen flattened, and with a white spot on the sixth segment. One of them measures only 15 mm.

*TABANUS RECEDENS* Walker (*T. catenatus* O. S. non Walker.)

Although it is a sad commentary on justice to recognize or give preference to Walker's name, yet I do not think it feasible to retain the name *T. catenatus* O. S.,

and thus infract two decided laws in zoölogical nomenclature. I have taken the males in Connecticut several times while feeding on *Cirsum*.

**TABANUS MELANOCERAS** Wiedemann.

To a single specimen from Georgia Wiedemann's description applies well, but a number of other specimens from Florida differ in their less hyaline wings, in the presence of small but distinct brownish clouds on the cross-veins, and a dark brown border to the stigma. They would be brought to *T. molestus* Say by Osten Sacken's table, but that they are not this species is evident from the coarctate first posterior cell and the presence of large-sized triangles on the second abdominal segment. The color of the thoracic dorsum is also often more reddish in the Florida specimens.

**TABANUS NIGRESCENS** Palisot Beauvois.—Virginia.

**TABANUS ÆGROTUS** Osten Sacken.

I have several males and females of this species, from Oregon and California, varying in length from 17 to 23 mm. The head of the male is large and convex, but the large and small facets are not distinctly separated, or very different in size.

**TABANUS PUNCTIFER** Osten Sacken.

All my specimens (California, Washington) of this easily recognizable species have the first posterior cell coarctate, as in some specimens of *T. stygius*, which I have from as far west as Kansas.

**TABANUS GIGANTEUS** Degeer.

This species I observed in extraordinary abundance at Vandalia, Ill., in the early part of September, causing much worry and annoyance to stock in the woodlands. I have it also from Florida.

**TABANUS SODALIS**, n. sp.

*Female*: Length, 15, 16 mm. Brownish black. Abdomen with a single row of conspicuous white triangles; wings without distinct clouds on the cross-veins; third joint of antennæ red at the base; first posterior cell not coarctate; eyes bare. Abdomen rather broadly oval; second, third, and fourth segments each with a large white triangle, expanding from a narrow posterior border, largest on the second, the fifth with only a small whitish spot, the first with a small but distinct one. Venter dark brown, broadly whitish pubescent and pollinose on the sides and the narrow posterior borders. Palpi whitish, with minute black and white hairs. Face and front yellowish white, the former with yellowish white pile. Frontal callosity nearly black, squarish, above it, and separated from it, a slender bare spot; front of nearly equal width. Antennæ black, the third joint red at the base, the upper angle moderately projecting, forming about a right angle, the annulated portion about two-fifths of the entire length. Dorsum of the thorax grayish brownish black, the ante-alar callosity red; pollinose stripes moderately distinct. Legs dark brown or black, the base of the tibiæ more or less luteous or reddish. Wings tinged with brownish, more distinctly so in the neighborhood of the stigma.

This species is nearest related to *T. coffeatus*, but will be at once distinguished by the presence of four bright green narrow horizontal stripes on the purple background of the eye. From *T. molestus* and *T. trimaculatus* the large triangle on the second abdominal segment will readily separate the species.

**TABANUS FUR**, n. sp.

*Female*: Length 17 mm. Abdomen with a single row of white triangles; wing cross-veins distinctly clouded with brown; legs red, the tarsal joints a little darker; angle of third antennal joint not produced.

Resembles *T. recedens* Walker, but is smaller; the annulate portion of the third antennal joint is shorter, not or scarcely a third of the length of the joint; the dorsum of the thorax is lighter colored, the markings less distinct, the pile of the pleuræ less abundant, the abdomen lighter colored, etc. The abdomen is ferruginous red, with a single row of rather narrow triangles; it is attenuated posteriorly, but less so than in *T. recedens*. Wings tinged with brownish, the veins broadly and diffusely clouded with brownish, the cross-veins very distinctly clouded with brown; first posterior cell coarctate. From *T. turbidus*, under which it would be sought for in Osten Sacken's table, and with which it might perhaps be best compared, the nearly square frontal callosity and the short annulate portion of the third antennal joint will immediately separate it. Two specimens, Florida.

TABANUS SPARUS Whitney, Can. Entom. xi, 38.

This species is closely allied to *T. pumilus*, and only by a careful examination is one able to distinguish it in the dried specimens. I have a number of specimens of *T. sparus* from Connecticut and Massachusetts, (July 1,) and three of *T. pumilus* from Indiana. In all of the former the lateral whitish spots of the second and third abdominal segments are broadly contiguous with the hind margins, while in the latter they form on all the segments, small, oval, isolated spots. Most distinctively characteristic of the two species, however, are the color-markings of the eyes, as I can corroborate from the revivification of my dried specimens. *T. pumilus* has two bright green stripes on purple ground, while in *T. sparus* the eyes are wholly light green with a purple reflection.

TABANUS FRATELLUS, n. sp.

*Female*: Length 8-9 mm. Abdomen with three series of isolated spots; wings hyaline; antennæ narrow; small species.

Palpi slender, white, with minute black hairs. Face grayish white, with white pile. Front brownish gray, convergent anteriorly; callus nearly square, black, with a larger, shield-shaped, shining spot above it. Antennæ blackish brown, the basal portion of third joint sometimes reddish brown, narrow, only a little wider at base of non-annulate portion, the angle feebly indicated. Thorax grayish black, with three well-indicated narrow gray stripes; pleuræ gray, with whitish pile. Abdomen black, with well-marked whitish hind borders to the segments; segments two-five each, with three small, rounded, transverse, whitish spots. Venter with grayish dust, and posterior whitish hind borders to the segments. Legs black, the base of front tibiæ, and the most of the four posterior tibiæ yellowish; four posterior tarsi brownish. Wings hyaline, stigma brown; first posterior cell open.

Two specimens, Washington Territory. The species closely resembles *T. pumilus*, but is darker, and the antennæ are much narrower at the base of the third joint, with the angle feebly indicated.

TABANUS GRACILIS Wiedemann, Auss. zweifl. Ins. i, 156, 71; Osten Sacken, Cat. Dipt., note 81, p. 228.

I recognize this species in a number of specimens from Florida. They agree well with Wiedemann's description, except in the color of the antennæ, which are either wholly red, or with the annulate portion brown. The slenderness, pale but distinct brown clouds on the veins of the wings, and general light color—lilac-reddish—throughout, will distinguish it. Osten Sacken, from an examination of the faded type, compared the species with his *T. longus*. From the description, indeed, it seems to be nearly related to that species, though differing in the lighter color, and brownish clouds on the wings. The lateral spots of the abdominal segments, in all my specimens, reach distinctly to the hind margin, the only thing that prevents

the species being brought to *T. longus* in Osten Sacken's table. The prevailing color of the abdomen is brownish-red. Their length is 12, 13 mm.

*TABANUS PYGMÆUS*, n. sp.

*Female*: Length 6 mm. Third antennal joint broad oval, not angulated, annulated portion short; frontal callus not denuded; tibiæ light yellow at base. Front rather broad, not narrowed anteriorly, callosity wanting or not denuded, in color light grayish yellowish. Face yellowish white, with white pile. Palpi white, not slender, with white hairs. Antennæ brownish red, the third joint short, basal portion large, only a little longer than broad, gently convex below and obtusely angulated in the middle above; annulate portion very short, not a third the length of the joint. Thorax grayish brown, with three slender lighter stripes. Abdomen light chocolate brown, with a large, oblique, posteriorly contiguous triangle, and a less distinct median triangle on the segments, grayish yellowish. Legs black, the base of the four anterior tibiæ whitish yellow, hind tibiæ, except the tip, and the base of the four posterior tarsi, yellow, the remainder of these tarsi brown. Wings hyaline, stigma brownish.

One specimen, Florida. The eyes appear to be in life green on the upper, purple on the lower portion.

*TABANUS PARVULUS*, n. sp.

*Female*: Length 7 mm. Front narrow, parallel; base of third antennal joint red; abdomen with a median stripe, and the incisures light yellowish; tibiæ yellow at base; wings with dark brown clouds on the cross veins.

Frontal callosity black, a little higher than broad, with a slender prolongation above. Antennæ red, the first joint and the annulate portion black, the latter nearly as long as the base of the joint, basal portion not broad, obtusely angulated. Face yellowish gray. Thorax yellowish gray, the dorsum with three broad reddish-brown stripes. Abdomen brown, the segments with distinct narrow, light yellowish hind margins, dilated in the middle into an uninterrupted narrow stripe, reaching from the base of the abdomen to the seventh segment. Legs brownish black, the base of the tibiæ, including a third of the front and two-thirds of the hind pair, yellow, the base of four posterior tarsi likewise yellow. Wings nearly hyaline, the narrow front border, becoming broader and more diffuse on the apex, brownish; all the cross-veins with narrow but strong brown clouds; second submarginal cell appendiculate.

One specimen, San Domingo. Singularly, the palpi are entirely wanting in my specimen, though there is no indication of the specimen having been injured.

*TABANUS FENESTRA*, n. sp.

*Female*: Length 13 mm. Black; front narrowed anteriorly; thorax chocolate brown; all the tibiæ light yellow; wings hyaline, the anterior and outer part brown, the latter with hyaline streaks.

Front yellowish gray, much narrowed anteriorly; the callus small, oval, continued above as a line; subcallus partly denuded. Face grayish yellowish, with whitish pile. Palpi black, second joint short and thick. Antennæ brownish red, the basal joints and annulate portion darker; basal portion of the third joint not very broad, the angle not salient. Dorsum of thorax chocolate brown, more or less grayish pollinose, pleuræ with black hair. Abdomen brownish black, with grayish bloom. Middle and hind femora dark brown, front femora brownish; all the tibiæ light yellow, the hind pair somewhat infuscated at tip; front tarsi light reddish yellow, posterior pairs darker. Wings subhyaline brown along the front part and at the tip; in the marginal and submarginal cells with light streaks; second submarginal cell appendiculate.

San Domingo. The eyes, as restored, show two horizontal green stripes on a greenish purplish background.

TABANUS ANNULATUS Say.

A specimen from Louisiana agrees very well with Wiedemann's description, though it does not have the dark abdomen as Say describes.

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## METEOROLOGICAL SUMMARY FOR THE YEAR 1886.

PREPARED BY PROF. F. H. SNOW, OF THE UNIVERSITY OF KANSAS, FROM OBSERVATIONS TAKEN AT LAWRENCE.

The year 1886 was marked by an excessively cold January, a long, hot summer, a dry atmosphere, light winds, and clear skies. But the most remarkable characteristic of the year was the very light rainfall of its second half. Up to the 1st of July the rainfall was only 1.79 inches below the average, but for the remainder of the year there was a deficiency of 9.23 inches, the total precipitation being less than half the normal amount. Although the total rainfall was much less than in any previous year of our record, the copious rains of the first six months secured good crops of wheat and half crops of corn in the districts most seriously affected by the drouth.

### TEMPERATURE.

Mean temperature of the year  $52.96^{\circ}$ , which is  $.04^{\circ}$  above the mean of the eighteen preceding years. The highest temperature was  $105^{\circ}$ , on August 16th; the lowest was  $18^{\circ}$  below zero, on the 9th of January, giving a range of  $123^{\circ}$ . Mean at 7 A. M.,  $47.13^{\circ}$ ; at 2 P. M.,  $62.16^{\circ}$ ; at 9 P. M.,  $51.28^{\circ}$ .

Mean temperature of the winter months  $23.33^{\circ}$ , which is  $5.88^{\circ}$  below the average winter temperature; of the spring  $54.57^{\circ}$ , which is  $.96^{\circ}$  above the average; of the summer  $76.80^{\circ}$ , which is  $.96^{\circ}$  above the average; of the autumn  $57.17^{\circ}$ , which is  $3.39^{\circ}$  above the average.

The warmest month of the year was July, with mean temperature  $79.54^{\circ}$ ; the warmest week was August 11th to 17th, mean  $86.93^{\circ}$ ; the warmest day was August 16th, mean  $90.62^{\circ}$ . The mercury reached or exceeded  $90^{\circ}$  on 53 days, (13 more than the average number,) viz.: two in May, three in June, twenty-one in July, eighteen in August, and nine in September. There were five days on which the temperature exceeded  $100^{\circ}$ —one in July and four in August.

The coldest month was January, with mean temperature  $14.32^{\circ}$ ; the coldest week was January 6th to 12th, mean temperature  $.61^{\circ}$  below zero; the coldest day was January 8th, mean  $12.75^{\circ}$  below zero. The mercury fell below zero on 16 days, of which 10 were in January, 3 in February, and 3 in December.

The last hoar frost of spring was on April 27th; the first hoar frost of autumn was on October 1st; giving an interval of 155 days, or over 5 months, entirely without frost. This is precisely the average interval.

The last severe frost of spring was on April 5th; the first severe frost of autumn was on the 27th of October; giving an interval of 203 days, or nearly 7 months, without severe frost. The average interval is 198 days. No frosts during spring and autumn caused damage to crops of grain and fruit, but the low temperatures of January were universally destructive to peach buds.

### RAIN.

The entire rainfall, including melted snow, was 24.25 inches, which was 11.02 inches below the annual average. Either rain or snow, or both, in measurable quan-